

REMARKS/ARGUMENTS

The Applicants thank the Examiner for her telephonic interview on 25 August 2005. All matters were discussed and several distinguishing features were identified and clarified. Several changes have been made to the claims in an effort to more clearly identify these features.

An Request for Continued Examination has been filed with this Amendment C. This amendment is responsive to the Office Action dated March 11, 2005. The outstanding rejections are respectfully traversed as applied to the currently pending claims.

The current status of the claims is as follows. **Claims 1, 3, 9, 10, 11, 13-15, 22, & 33 are amended** herein. **Claims 2, 17, 23-30, & 34 are canceled**. New Claims 36-41 have been **added**. Therefore, **Claims 1, 3-16, 18-23, 31-33, & 35-41 are pending**. Entry of the above amendments and reconsideration of the claims in light of the comments herein is requested.

Rejections under 35 U.S.C. § 112

Many claims are rejected under 35 U.S.C. § 112, second paragraph. Several different grounds are asserted. Each of these grounds will be discussed in turn.

• 1) One position asserted in the Action is that the structures claimed in **Claims 1, 11, and 15** are “intermediate” structures and therefore is rejected under § 112. The applicants disagree for several reasons. For one, **Claim 15** is a complete structure. The die is mounted, electrically connected and the encapsulated with a second dielectric layer. Nothing more need be done to complete the structure.

As for, the claimed substrate panels (“intermediate structure”) of **Claims 1 & 11**. These embodiments relate to “a substrate panel for use in semiconductor packaging.” Thus, they are directed to substrate panels that are formed without the top encapsulant layer. This is not an intermediate structure. These claimed structures can be final products and, in fact, are sold to customers in exactly the form claimed in Claims 1-14. As such it is the finished product not an “intermediate structure”. An example of such a panel is depicted, in Fig. 5A with a die mounted on top. These substrates are depicted with exposed contacts (e.g., 136, 133, 168 and so on) on the bottom. Also, wire bonding landings 132 are depicted on top (See, additionally, Figs. 3C, 4B, 5A, etc.). In the outstanding 112 rejections, the position appears to be that since the substrate panel can be used in a fully encapsulated semiconductor package, that the wire bonding landings would likely not be exposed in the final package. The applicants restate that, in some implementations, the top surface of the substrate panel can be fully encapsulated (possibly covering the uppermost contacts). However, there is no teaching that such a structure must be

encapsulated. Such encapsulation is only one possible implementation. Thus, assertions that such product is required to be encapsulated only or that the top surfaces are not exposed is unsupported by the teachings of the specification and therefore is an improper rejection.

The applicants point out that, in the Action, the only support offered is that paragraph [0020] states that Fig. 5A is shown "before encapsulation". The supporting language does not require any such encapsulation. On the contrary, this language merely confirms that the structure of Fig. 5A can be encapsulated not that the structure must be encapsulated. It is significant that Action does not point to a portion of the specification that requires the panel be encapsulated. This is because the Specification is intended to capture both implementations of the inventive concept. To reject the claimed structure as an "intermediate structure" is akin to denying a patent on "Kool-Aid" because it must be put in water before you drink it. This is not the law. The claimed apparatus are suitable for their intended purpose. That is enough to overcome any assertion of intermediate structure.

Accordingly, the applicants submit that the asserted rejections fail to establish a *prima facie* case of indefiniteness under § 112. Consequently, the applicant request that this ground of rejection be withdrawn as to Claims 1, 11, and 15 (and the claims depending therefrom).

• 2) Additionally, another § 112 rejection is applied to **Claims 1, 11, and 15**, arguing that there are no contacts, lead segments, or bond pads described in the specification. In the August 25, 2005 interview the applicants explained the nature of these features and where they were shown in the Specification and Drawings. For example, Fig. 3C and the specification describe conductive structures that have "contacts" 130 electrically connected to "wire bonding landings" (e.g., 132) using "lead segments" 134. Thus, Fig. 3C clearly shows the position, arrangement, and orientation of the "contacts" 130, "wire bonding landings" (e.g., 132), and "lead segments" 134 relative to each other. As a result, a *prima facie* case for indefiniteness under 112 has not been established. Therefore, that this rejection should be withdrawn.

• 3) In another 112 rejection, portions of **Claims 9 and 22** reciting "at least one of the wire bonding landings is directly electrically coupled to the die attach pad by only an additional lead segment" are characterized as lacking "clear meaning". As explained in the interview, the "additional lead segment" is depicted clearly in, for example, Fig. 3C which shows four such additional lead segments. These additional lead segments are depicted as the lead segments that extend from bond pads near the edge of the panel all the way to the centrally located die attach pad to form the claimed electrical connection. As a result, a *prima facie* case for indefiniteness under 112 has not been established. Therefore, that this rejection should be withdrawn.

• 4) In another 112 rejection, the portion of **Claim 10** reciting "the contacts are located closer to the die attach pad than their associated wire bonding landings" is also characterized as lacking "clear meaning". The applicants respectfully disagree. Fig. 3C shows "wire bonding landings" 132 and associated "contacts" 130. There are many instances where the contacts 130 are located closer to the die attach pad 131 than the associated wire bonding landings 132. As a result, a *prima facie* case for indefiniteness under 112 has not been established. Therefore, that this rejection should be withdrawn.

All remaining claims rejected under 35 U.S.C. § 112 are all based on the claims discussed above. Accordingly, for at least the reasons advanced above, all of the dependent claims should also be allowable. Therefore, the applicants respectfully submit that based on the foregoing amendments and explanatory remarks, all pending §112 rejections have been successfully traversed. Accordingly, for at least the reasons expressed above, the applicants request that the pending rejections be withdrawn.

Rejections under 35 USC 102

Claims 1, 2, 4, 5, 7, 9, 11, 12, 14, 15, 17, 19 and 22 were all rejected as being anticipated by *Huang* (USPN 6,384,472). The applicants respectfully submit that *Huang* does not teach all elements of the claims as amended and therefore submit that the pending rejection is successfully traversed. In the August 25 interview the applicants clarified that the prior art is a standard leadframe package which is not the same as the claimed substrate which has the advantage of being configured as a micro array (i.e., a BGA substrate analog).

Independent Claims 1, 11 and 15

Independent claims 1, 11 and 15 each claim a lead frame having: (a) a plurality of contacts (i.e., 130); (b) a plurality of wire bonding landings (i.e., 132); and lead segments (i.e., 134) that electrically couple selected wire bonding landings to associated contacts. *Huang* does not include each of these elements and so fails to establish a *prima facie* case of anticipation.

The pending rejection identifies component 104 (i.e., the leads 104) of *Huang* as lead segments. Conversely, the rejection also relies on those same leads 104 to teach the contacts. It is respectfully submitted that since the bottom surfaces of the cited leads 104 (in *Huang*) act as the contacts, the Action has not identified (and *Huang* does not disclose) lead segments that electrically couple wire bonding landings to associated contacts. Accordingly, the rejection does not teach all required elements of the claims.

This simply a case of trying to use one part to teach two different claimed elements at the same time. For example, the leads 104 are first used as lead segments. Then in order to establish the rejection the lead segments 104 are changed into contacts. Unfortunately, it is required that each element must be found in the reference. The cited art (*Huang*) fails to establish the three required elements. Instead, by using the leads 104 as both the lead segments and the contacts, the Action has taught some other invention, not the claimed device which requires both leads segment and contacts. Accordingly, the cited art has failed to establish a *prima facie* case of anticipation and therefore the rejections of these claims should be withdrawn.

Another important distinction between the cited art and the claimed invention is the applicability of the claimed invention to a configuration as a micro array that is similar to a BGA package (See, Fig. 5B). The cited art packages are all directed to leadframe packages having edge connectors only. The claimed invention used connectors that are "exposed on a bottom surface of the substrate panel" to obtain far higher connector density.

These limitations are especially clear in Claims 11 and 15 which include "contacts ... arranged in a microarray configuration" or "a substrate including a plurality of contacts configured for electrical contact underneath the substrate with the contacts having exposed contact surfaces on a bottom surface of the substrate". The cited art is configured for edge contact and is not configured in a micro array. Also, the edge mounted prior art is not configured for contact underneath the substrate.

Huang also does not teach a "top surface of the dielectric material is substantially coplanar with the top surface of the substrate panel and the wire bonding landings" as recited in Claims 1, 11, & 15. In *Huang* non-planar dielectric walls 124 extend substantially upward from the base of the lead frame panel. These protrusions 124 are not a "top surface of the dielectric material ... substantially coplanar with the top surface of the substrate panel". Accordingly, *Huang* fails to teach this limitation as well.

In view of these points, it is respectfully submitted that the *Huang* reference is insufficient to establish a *prima facie* case of anticipation as to base claims 1, 11, and 15. Accordingly, the rejections of these (and all dependent claims) are overcome and should be withdrawn for at least this reason.

Additionally, it is fairly clear that *Huang* is deficient as to a number of the dependent limitations as well. For example, Claims 3 & 18 claim that "the wire bonding landings are thinner than the substrate panel, such that the wire bonding landings are not exposed on the

bottom surface of the substrate panel". An example of this concept is illustrated in Fig. 5A of the present application. The bonding wire 140 is adhered to the thin (half etched) portion defined by wire bonding landing 132. Whereas in the cited art, the wire is attached to the thick (i.e., passes all the way through the substrate) portion 104 which is directly connected to the bottom of the substrate. Thus, the two structures are dissimilar.

In an additional example, **Claims 4 & 19** teach a substrate panel with "portions of the lead segments [that] are thinner than the substrate panel such that the selected portions of the lead segments are not exposed on the bottom surface of the substrate panel". There is no indication of any such lead segments in the Huang reference. In fact the only such electrical connections taught by Huang are the wire bonds 140. In another way of looking at claim 4, it is pointed out that claim 4 requires that the lead segments (the portions contacted by the wire bond connection) NOT be exposed on the bottom surface of than the substrate panel. The outstanding rejection identified leads 104 of Huang as corresponding to the recited lead segments. Although that position is respectfully traversed, as described above, it is noted that leads 104 are almost completely exposed on the bottom surface of the substrate and thus would not meet the language of claim 4 for at least this reason as well. Accordingly, the Huang reference again fails to teach all of the claim limitations under 35 U.S.C. § 102.

Also, as pointed out above, **Claims 3-10, 12-14, 16 18-23, 31-33 and 35** each depend either directly or indirectly from one of the independent claims 1, 11 or 15 and are therefore respectfully submitted to be patentable over the art of record for at least the same reasons as set forth above with respect to the independent claims. Additionally, these dependent claims require additional elements that when considered in the context of the claimed invention, further patentably distinguish the art of record. For example, **Claim 4** requires that the lead segments NOT be exposed on the bottom surface of than the substrate panel. The outstanding rejection identified leads 104 of Huang as corresponding to the recited lead segments. Although that position is respectfully traversed, as described above, it is noted that leads 104 are exposed on the bottom surface of the substrate and thus would not meet the language of **Claim 4** for at least this reason as well. Accordingly, it is respectfully submitted that the outstanding rejection of **Claim 4** should be withdrawn for at least this reason as well.

In general, the applicants believe that *Huang* falls short of teaching or suggesting the present invention. Some of these shortcomings have been pointed out in the discussions hereinabove. For at least the reasons above it is respectfully requested that all anticipation rejections under 35 U.S.C. §102 be withdrawn.

Rejections under 35 USC 103

A few of the claims were rejected under § 103 based upon combinations of the *Huang* reference and either *Lee* (USPN 6,713,322) or *Chien-Hung et al.* (U.S. Pat. Appl. No. 2003/0006055 hereinafter “*Chein-Hung*”). These rejections fail to establish a *prima facie* of obviousness for least the reasons set forth above with respect to base claims 1, 11, and 15. Additionally, most of these dependent claims recite additional elements that when considered in the context of the claimed invention further patentably distinguish the invention from the cited art.

Rejections Under *Huang* and *Lee*

Claims 3, 6, 10, 16, 18, 20, 31-33 are all rejected under § 103 as being patentable over *Huang* in view of *Lee*. These will each be discussed in turn.

Claims 3, 18, & 20 are all believed to be allowable for at least the reasons advanced in support of the base Claims 1 and 15. In other words, *Huang* fails to teach or suggest (a) a plurality of contacts (i.e., 130); (b) a plurality of wire bonding landings (i.e., 132); and lead segments (i.e., 134) that electrically couple selected wire bonding landings to associated contacts. Nothing in *Lee* remedies this basic failing of *Huang*. Accordingly, the cited art fails to establish a *prima facie* case of obviousness as to these claims and therefore the pending rejections should be withdrawn. The same can be said of Claims 6, 10, 16, & 31-33 which are further discussed below.

Claim 6 recites “tie bars being positioned between immediately adjacent device areas in the two dimensional array of device areas and configured to support the lead segments”. This is not the case in *Huang* and is also not the case in *Lee*. No tie bars are taught at all in *Huang*. So that that leaves only *Lee* as relevant. *Lee* teaches a frame 2 that supports the device areas. The tie bars lie well within the frames and within the device areas (bounded by elements like 10, 12, 14, etc.). A quick contrast of FIG. 17 of *Lee* with Fig. 3B of the present application clearly shows that, by the standards of the present invention, *Lee* does not even have tie bars. To the extent *Lee* could be construed to have any such tie bars (e.g., 4) they are not positioned between adjacent device areas. At most the tie bars are positioned inside the device areas of which they are a part and cannot be “adjacent” to adjoining device areas. Accordingly, the combination of *Lee* and *Huang* do not teach or suggest all the claimed elements of Claim 6. Accordingly, the rejection of claim 6 fails to establish a *prima facie* case of obviousness and should be withdrawn.

Claim 10 recites "contacts are located closer to the die attach pad than their associated wire bonding landings". This point is acknowledged as a deficiency in *Huang*. Moreover, as explained presently, this is also a deficiency in *Lee*. The Examiner offers the wire bond pads 6 of *Lee* as contact. This is of course wrong on its face. In every case *Lee* identifies the pads 6 as wire bonding pads not contacts. There is not teach or suggestion otherwise. Accordingly, the combination of *Lee* and *Huang* do not teach or suggest all the claimed elements of Claim 10. Accordingly, the rejection of claim 10 fails to establish a prima facie case of obviousness and should be withdrawn.

Claim 16 recites that the "first and second dielectric layers are formed from substantially the same materials but are not integrally formed". The Examiner points to first layer 124 and second layer 126 in *Huang* Fig. 5 to support this rejection. This interpretation of *Huang* is at odds with the *Huang* Specification which states that 126 is not a layer at all but merely a "chip containing space (See, *Huang* e.g., at 4:6). Additionally, *Lee* does not disclose first and second layers (especially at the specified FIG. 10) only a single layer 26. Accordingly the combination of *Huang* and *Lee* does not comprehend the separately formed base substrate containing and supporting the lead frame and the subsequent formation of the second layer that seals the chip in the device package. These ideas are completely different from anything taught or suggested by the cited references either together or separately. Accordingly, it is respectfully submitted that nothing in the *Lee* reference would motivate one to alter the device disclosed by *Huang* in a manner that would teach all the limitations of claim 16. Moreover, the cited combination fails to teach or suggest the claimed limitations. Accordingly, the rejection of claim 16 fails to establish a prima facie case of obviousness and should be withdrawn.

Claim 31 recites that the "wire bonding landings are located radially further from a center of their associated device area than their associated contacts". The Examiner rejects this claim without actually identifying any "contacts" in either *Lee* or *Huang*. Accordingly, the cited art fails to teach or suggest the claimed limitations. Accordingly, the rejection of claim 31 fails to establish a prima facie case of obviousness and should be withdrawn.

Claims 32 & 33 recite that "at least some of the wire bonding landings have a width that is wider than an immediately adjacent portion of their associated lead segments and a thickness that is substantially the same as their associated lead segments." The Examiner rejected these claims without particularly identifying any features that teach a bond pad being wider than the connecting lead segment. *Huang* of course includes no teaching of width at all (being a top view where no width is displayed at all). As to *Lee*, the "wire bonding landings" 6 are not shown

having any width greater than the associated lead segments (not shown at all). Thus, the cited art fails wholly to teach or suggest any aspect the claimed limitations. Accordingly, the rejections of claims 31 and 32 fail to establish a *prima facie* case of obviousness and should be withdrawn.

Rejections Under *Huang* and *Chein-Hung*

Claims 8, 13, & 21 are all rejected under § 103 as being patentable over *Huang* in view of *Chein-Hung*. These claims are all believed to be allowable for at least the reasons advanced in support of the base Claims 1, 15, and 18. In other words, *Huang* fails to teach or suggest (a) a plurality of contacts (i.e., 130); (b) a plurality of wire bonding landings (i.e., 132); and lead segments (i.e., 134) that electrically couple selected wire bonding landings to associated contacts. Nothing in *Chein-Hung* has been offered to remedy this basic failing. Accordingly, the cited art fails to establish a *prima facie* case of obviousness as to these claims and therefore the pending rejections should be withdrawn.

Moreover, it is fairly clear that the cited art also failed to teach all the limitations of the dependent claims as well. For example, Claim 8 recites a “die attach pad [that] has a plurality of posts exposed on the bottom surface of the substrate panel” and a limitation in the base claims of “a dielectric material that fills spaces between adjacent lead segments, wherein a top surface of the dielectric material is substantially coplanar with the top surface of the substrate panel and the wire bonding landings, and the bottom surface of the dielectric material is substantially coplanar with the bottom surface of the substrate panel and the lead contacts, thereby forming a substrate panel having substantially planar top and bottom surfaces”. It is quite clear, that the bottom dielectric material 261 is not at all coplanar with the bottom. Additionally, the dielectric material 220 that fills the top of the substrate is not coplanar with the top surface of the substrate as required by the claims. Accordingly, the cited combination of references fails to teach the above recited limitations. Moreover, substantially the same limitations are recited in Claims 13 and 18, so the same arguments similarly apply. Accordingly, because the cited art fails to teach or suggest all of the claim limitations it fails to establish a *prima facie* case of obviousness. Therefore the pending rejections should also be withdrawn.

New Claims

New Claims 36-41 address specific patentable features. For example, Claims 36-39 are directed to microarray features (i.e., the BGA-like array of contacts that underly the substrate). Claims 40-41 are directed to support feet at the bottom of wirebonding pads.

Conclusion:

In view of the foregoing amendments and remarks, it is respectfully submitted that the claimed invention as presently presented is patentable over the art of record and that this case is now in condition for allowance.

Accordingly, the applicants request withdrawal of all pending rejections and request reconsideration of the pending application and prompt passage to issuance. As an aside, the applicants clarify that any lack of response to any of the issues raised by the Examiner is not an admission by the applicant as to the accuracy of the Examiner's assertions with respect to such issues. Accordingly, applicant's specifically reserve the right to respond to such issues at a later time during the prosecution of the present application, should such a need arise.

As always, the Examiner is cordially invited to telephone the applicants representative to discuss any matters pertaining to this case. Should the Examiner wish to contact the undersigned for any reason, the telephone numbers set out below can be used.

Respectfully submitted,

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